Control Loop Assistant Controller Tuning Software

The aim of the Control Loop Assistant (CLA), developed by Lambda Controls, is to provide a software tool to assist instrument technicians or engineers accomplish three main tasks in optimizing control loops in the process industries: (i) evaluate control loop health issues, most importantly, control valve dynamic performance and control loop non-linearities; (ii) determine a dynamic process model and (iii) calculate controller tuning constants. The key to achieving these goals is that several (perhaps as many as a dozen or more) manual bump tests must be performed on the loop and then analyzed.

CLA is designed to facilitate viewing and analyzing the process data obtained from a control loop during a sequence of bump tests. The key to being able to analyze this data quickly and easily is to make use of the powerful windows interface to conveniently view the data as required using high quality graphs, through the use of mouse initiated zooming and data marking. These features make it easy to locate each of the bump tests in the data and mark each bump test for subsequent analysis. A good view of the process response is obtained even when the bumps being made are quite small.

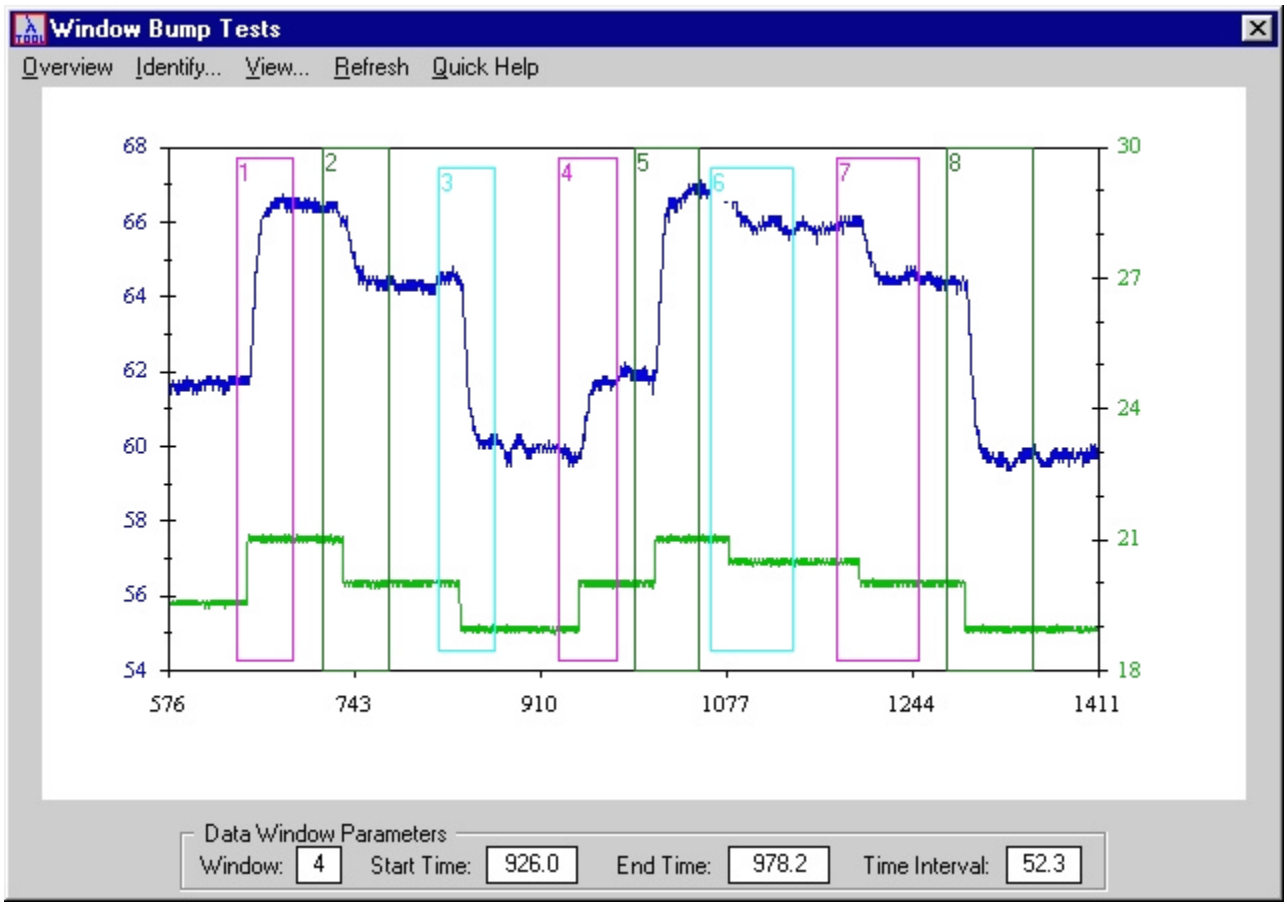
Attention has been paid to developing a user-friendly human interface. This should appeal to instrument technicians working in a maintenance environment where many control loops must be managed.

The Control Loop Assistant provides the basic functionality required to optimize and maintain control loop performance with an easy to use windows interface.

Software Description

Windowing the Bumps

After bump test data has been read in to CLA, the next step is to mark the locations of each of the bump tests in the data. This is referred to as Windowing the bumps and is shown below.

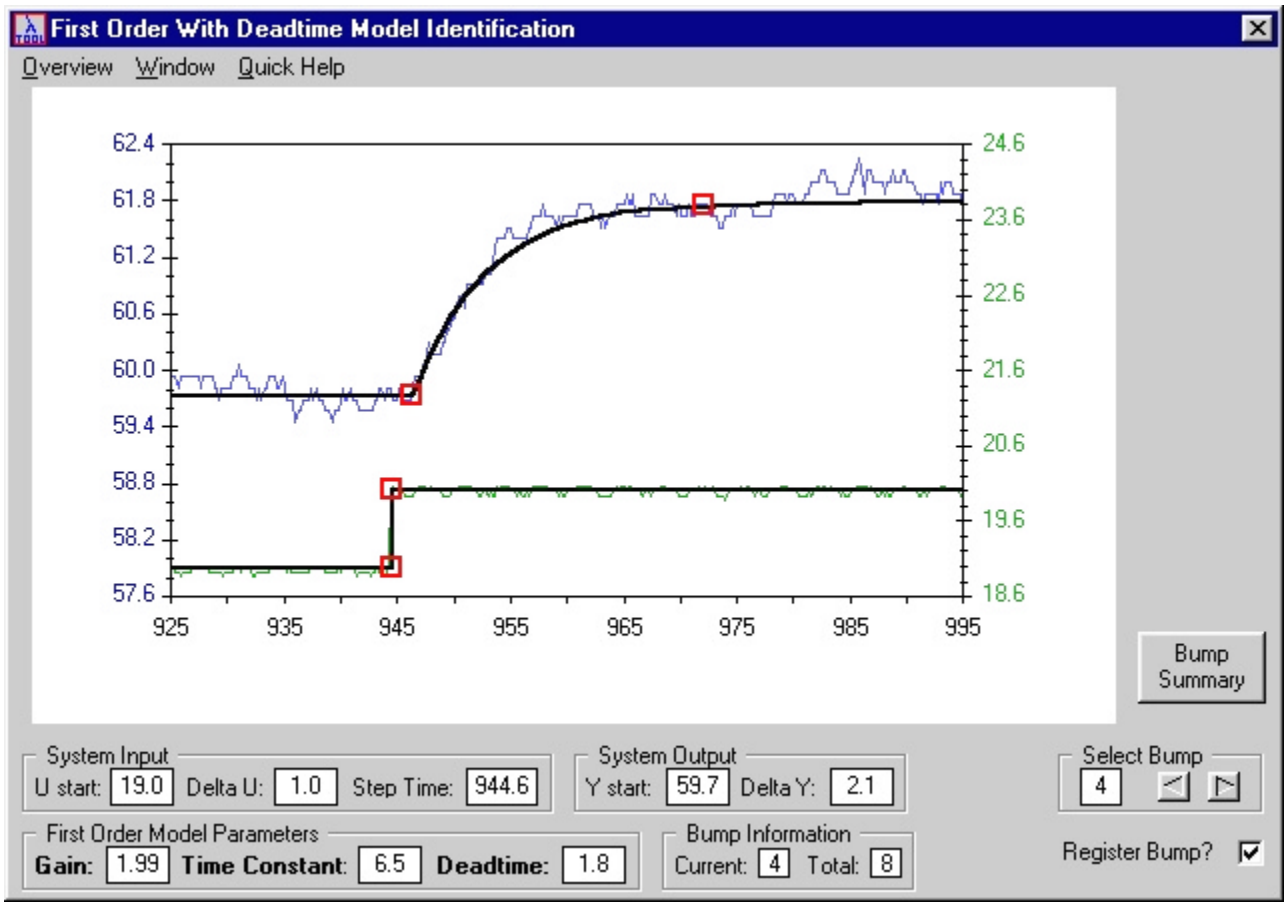


Both the PV (shown in Blue) and the Controller Output (shown in Green) are displayed on a single graph with a left scale (Blue) used for the Process Variable and the right scale (Green) used for the Controller Output. Each bump test is marked with a Data Window for subsequent analysis.

Bump Test Analysis

Each of the bump tests is inspected for control loop non-linearities or to develop a process model. CLA currently supports two linear process models: (i) First Order with Deadtime model (typically used for loops like flows or pressures) and (ii) Integrator with Deadtime model (typically used for tank levels).

The Lambda Control Loop Analyzer software makes it easy to analyze control loop dynamics. A step input and the process model response are overlaid on the bump test data, with a rough fit of the model to the data. The square grab handles shown in Red can be dragged on the screen using the mouse to move the step input and the model response curve to obtain the best fit to the data. As the grab handles are moved the process model parameters update to the new values. This is shown below using a First Order with Deadtime model.



Bump Test Results Summary

The bump test results are summarized and presented in table form.

Tuning Calculations

The average values can be used as the values selected for tuning purposes or adjustments can be made if desired. The common choices for the form of the PI controller can be selected by the user. Controller tuning is calculated using the Lambda Tuning method, which requires the user to specify the closed-loop time constant, namely Lambda. Once the required information is specified, the controller tuning constants are calculated. A control loop summary can also be generated.

LAMBDA CONTROLS

17 Erbsville Road (R3), Waterloo, Ontario, Canada N2J 3Z4

Tel.: (519) 884-6998, Fax: (519) 884-1089, E-mail: inquiries@lambdacontrols.com

Web site: www.lambdacontrols.com